CHAPTER 3. STORM WATER PLANNING

CONTENTS

FIGURE

1.0 OVERVIEW

Storm water drainage systems are an integral part of the urban community. It is imperative that runoff and drainage patterns be considered early in the design process for new developments—before layout begins. Preliminary drainage planning is primarily a matter of space allocation. Good drainage planning results in lower-cost drainage facilities for the developer and the community, a more functional community infrastructure, and improved public health, safety and welfare. Some of the benefits that result from a well-planned storm drainage system include:

1. Minimized constrictions to conveyance and storage.
2. Minimized increases in peak flows, diversions, improper discharges, and other actions that can potentially harm neighboring properties.
3. Improved water quality and protection and enhancement of environmentally sensitive areas.
4. Reduced street construction and maintenance costs.
5. Reduced storm drainage system construction and maintenance costs.
6. Reduced excavation, fill, and grading costs.
7. Better building sites for homes or businesses.
8. Improved aesthetics of overall development with more opportunities to make the storm drainage system a development amenity.
9. Lower-cost open space and park areas and more recreational opportunities.

As watershed plans are completed and made available to the public, well-planned developments can be designed to adhere to the plans, which identify requirements for flood control, detention, and water quality management throughout a watershed.

A well-planned major drainage system can reduce or eliminate the need for underground storm sewers, and it can protect the urban area from extensive property damage, injury, and loss of life due to flooding. The major drainage system exists in a community, regardless of whether it has been planned and regardless of whether development is situated wisely with respect to it. Water will obey the law of gravity and flow downhill to seek its lowest level, regardless of whether buildings and people are in its way. The planning process can best serve the community by making sure that natural prescriptive easements are maintained along major drainage routes. Floodplain delineation and open space designations are key tools for effective major drainage system planning and can be applied to both small and large waterways.

A well-planned street and onsite drainage system is also critical to the overall effectiveness of flood control and water quality. Often, a subdivision or overall development master plan is filed in the Department of Public Works and/or Department of Planning and Development that governs how the drainage system of an individual lot should be designed. Planning for the proper location and sizing of inlets, pipes, detention basins, and Best Management Practices (BMPs) is necessary to effectively control downstream flooding and meet water quality requirements.

2.0 DRAINAGE PLANNING PRINCIPLES

Effective drainage planning is conducted in the context of the overall watershed and requires attention to major drainageways, the initial (streets and onsite) collection system, water quality best management practices (BMPs), transportation improvements, open space goals, and compliance with relevant permits. An overview of key considerations with regard to each of these factors is provided in this section, with more detail and criteria on specific topics developed in the remainder of this manual.

2.1 Watershed Plans

A watershed plan provides overall guidance for future actions and improvements for all or part of a developing watershed. The watershed plan is a road map of the steps necessary to achieve established goals within a watershed. Watershed goals are determined by examination of the overall drainage system, the context of the larger watershed, and public input. The goals may be determined by federal or state mandates such as pollutant discharge limits, Missouri Water Quality Standards, or a Total Maximum Daily Load (TMDL). Watershed planning may involve decisions regarding requirements for floodplain and open space management, regional detention or water quality improvements, requirements for new developments, opportunities for integration with recreation, means of accommodating conflicting utilities, and potential alternate uses for open channels, detention, and water quality facilities. Special considerations in areas of karst topography may also be needed. Watershed plans are unique and may result in different requirements in different watersheds. Master plans may cross jurisdictional boundaries requiring cooperation between governmental entities to achieve a common goal. To be effective, the master plan must have a consensus with thorough attention to engineering concepts and details so it is applicable for day-to-day use by local and regional governmental administrators. Preparing watershed plans helps to ensure the overall effort is coordinated with other predetermined objectives (ASCE and WEF 1992).

Early in the design of new developments, it must be shown the drainage system and land use will adhere to any watershed plans. Watershed plans may set drainage requirements for new developments or retrofitting of redeveloping sites. If the watershed plan cannot be adhered to, the developer must show why it is not possible to do so.

2.2 Major Drainageways

Nature possesses, by prescription, an easement for the intermittent presence of runoff waters along floodplains and major drainageways. Humans can deny this easement only with great cost and difficulty. Encroachments upon or land modifications within this easement can have adverse effects both upstream and downstream. Major drainageways are generally defined as those having a contributing drainage area exceeding 40 acres. In these areas, land planners must establish floodplain boundaries and waterway setbacks to be contained within an easement in accordance with Chapter 12 of this manual. Under certain conditions, such as the presence of exceptional natural resources, major drainageways may be designated in areas with less than 40 acres of contributing drainage area. Major drainageways should generally be preserved when they exist in a natural condition, except where grade control, erosion protection, or restoration are needed. The practice of lining, straightening, narrowing, and filling major natural waterways, such as wet and dry streams, is strongly discouraged. The practice of preserving natural waterways provides benefits such as water quality enhancement, preservation of natural floodplain storage, reduction of channel erosion, preservation of habitat, and opportunities for parks, greenway trails, and other recreational uses.

Major drainageways can consist of open channels or closed conduits, such as box culverts and large pipes. In general, open channels are strongly preferred to closed conduits. Open channels can include stabilized natural waterways, modified natural channels, or artificial channels with grass or other lining. The character of the major drainageways may change from reach to reach to account for neighborhood needs and environmental requirements. The design storm for the major drainage system is the 100-year (1 percent Annual Exceedance Probability [AEP]) rainfall for drainage areas one square mile or larger, and 25-year rainfall for drainage areas less than one square mile. Flows from the 100-year design storm must be contained within the drainage easement in all cases.

When planning a new development, a variety of drainage concepts should be evaluated prior to determination of the location of streets and lot layout. This is the point in the development process where the greatest impact can be made regarding the cost of the drainage facilities and how well they will perform. Developments should be designed around drainage patterns and existing topography to achieve the most efficient drainage system. The designer should begin by determining the location and width of existing waterways and floodplains. Streets and lots should be laid out in a manner that preserves the existing drainage system to the greatest extent practical. Constructed channels should only be used when it is not practical or feasible to use the existing waterway.

A preliminary estimate of the design flow rate is necessary to approximate the capacity and size of a channel or conduit (See Chapter 5, Calculation of Runoff). Proposals to modify major natural waterways should be submitted to the City for approval prior to detailed design. In such cases, it must be shown why it is not feasible to preserve the natural major drainageway.

Sections 2.2.1 through 2.2.3 identify important planning-level considerations for major drainageway planning, including factors related to open channel design, stream setback requirements, and floodplain regulations. Chapter 8, Open Channels, provides detailed discussion of open channels, including design criteria

2.2.1 Open Channels

The use of open channels for major drainageways can have a significant advantage with regard to cost, capacity, the potential for recreational uses, aesthetics, environmental protection/enhancement, and potential for detention storage. Use of open channels in new developments typically falls under one of the following categories:

- Existing natural channels that are stable and expected to remain stable and are being preserved in a natural state.
- Existing natural channels that are not stable or are not expected to remain stable due to changes in the watershed and are therefore being stabilized with bioengineering methods.
- Existing or proposed semi-improved channels where there is some intervention, such as grading, but the channel appears to be natural and is lined with vegetation such as grass and trees.
- Existing or proposed improved channels with a natural lining, such as a trapezoidal grass channel that is mowed on a regular basis. An improved channel may include a small, concrete low-flow channel to reduce erosion and allow the grade to be maintained.
- Existing or proposed improved channels with a hard lining where concrete, rock or other armoring makes up a significant part of the channel, such as rectangular or trapezoidal concrete or riprap channels.

The volume of storm runoff, peak discharge rate, and frequency of bank-full discharges from an urban area are usually significantly larger than under historic, undeveloped conditions (Leopold 1994; Urbonas 1980; ASCE and WEF 1992; WEF and ASCE 1998). The engineer must recognize that when natural channels begin to carry storm runoff from a newly urbanized area, the changed runoff regime will result in new and increased erosional tendencies. Careful hydraulic analysis of natural channels must be made to foresee and counteract these tendencies. In nearly all cases, some modification of the channel will be required to create a more stabilized condition to withstand changes to surface runoff created by urbanization. Typically, this involves construction of grade controls or drop structures at regular intervals to decrease the thalweg (channel invert) slope and control erosion. Bank and bottom stabilization may also be necessary. When site conditions are conducive, channels should be left in a condition as close to natural as feasible, subject to the requirement of demonstrated stability during the 25-year event.

Extensive channel modifications should not be undertaken unless they are found to be necessary to avoid excessive erosion with subsequent sediment deposition and water quality deterioration.

Decisions related to using the existing channel or needed improvements to the channel include:

- Space availability within the development.
- Existing and required channel capacity for flood control.
- Condition of existing facilities.
- Recent and expected changes in upstream runoff from the contributing watershed.
- Physical characteristics of the natural channel such as slope, soil characteristics, and vegetative condition.

When feasible, it is preferred that natural channels be preserved or improved through bioengineering methods. If that is not feasible, improved grass channels are generally preferred to channels with a hard lining, except where necessary due to the physical or hydrologic characteristics of the site. The benefits of a stabilized natural channel can include:

- Lower flow velocities, resulting in longer concentration times and lower downstream peak flows.
- Channel and adjacent floodplain storage that tends to decrease peak flows.
- Lower maintenance needs.
- Protection of riparian and aquatic habitat.
- A desirable greenbelt and recreational area that adds significant social benefits.

While recognizing the need for at least some stabilization measures to address the hydrologic changes caused by urbanization, the more an artificial channel resembles the character of a natural channel, the greater these benefits will be realized. See Chapter 8, Open Channels, for specific design criteria along major drainageways.

2.2.2 Stream Setbacks

Setbacks or buffer zones are areas to be left undisturbed along major drainageways that must be provided in accordance with standards given in Chapter 8, Open Channels. When the standard setback cannot be provided, additional BMPs may be acceptable to compensate for the lack of setback. In cases of a meandering channel, it may be necessary to provide additional setback or buffer zone beyond the

minimum standard to account for future channel movement. Likewise, where a deep, incised channel exists, a buffer zone allowance should be provided for bank sloughing and future channel modification by creating a setback line computed at a bank slope of 4:1 (horizontal to vertical) measured from the bottom of the channel bank.

2.2.3 Floodplain Regulation

Floodplain regulation is a necessary action for a government to exercise its duty to protect the health, safety, and welfare of the public. The concept of the existence of a natural easement for the storage and passage of floodwaters is fundamental to the assumption of regulatory powers in a definable flood zone. Floodplain regulation must define the boundary of the natural easement and must delineate easement occupancy that will be consistent with public interests. Authority for floodplain regulation is described in Chapter 2, Section 4.3, and specific management requirements for floodplain regulation are described in Chapter 1, Section 5.0. The following types of maps can be referenced to identify flood-prone areas in the City for use in drainage planning:

- Federal Emergency Management Agency (FEMA) Floodplain Maps: An important tool to assist with good floodplain management is the FEMA floodplain map. The National Flood Insurance Act of 1968 established the National Flood Insurance Program (NFIP), which included a national floodplain mapping effort. Certain areas in the City have been designated as floodplains and are regulated as required by the NFIP. While these maps were created to indicate risk factors for determining appropriate flood insurance rate premiums, they are also useful for designating flood prone areas. Any developer considering developing property in the City should obtain a copy of the FEMA floodplain map and understand the effects any floodplain may have on a proposed development.

- City Flood Hazard Area Maps: In addition to floodplains shown on the FEMA map, other flood-prone areas exist throughout the City along major drainageways and sinkholes, which are subject to City regulations for flood control. These areas may be mapped on City Flood Hazard Area Maps, which are another tool to assist the City and the public in identifying flood prone areas. Developers should also refer to these maps and understand the effects a flood hazard area may have on a proposed development. Other flood prone areas may exist in the City that are not shown on these maps. Engineering studies must be conducted to identify these areas prior to development.

2.3 Street and Site Drainage

Effective drainage planning also requires thorough attention to the initial or minor drainage system. This section provides a planning-level overview of key considerations for street and site drainage and on-site

detention. Chapter 6 should be referenced for detailed design criteria for streets, inlets, and storm drains, and Chapter 9 should be referenced for design criteria for detention for flood control.

2.3.1 Street Inlets and Pipes

Streets serve as part of the initial collection system in an overall drainage system. The objective of street drainage design is to reasonably minimize inconvenience to the traveling public, provide for safe passage of emergency vehicles during runoff from up to a 100-year event, and prevent the overflow of runoff from streets onto private property during runoff from up to a 100-year event. A well-planned street location and preliminary design can greatly reduce street drainage improvement construction costs. Pipes and boxes must be designed to convey the 25-year design flow. Inlets must be designed to limit spread based on the street classification. The design flows that must be considered include the 2-, 25-, and 100-year design flows. See Chapter 6, Streets, Inlets and Storm Drains, for more detailed design criteria.

2.3.2 Site Drainage

The initial collection system within a development may include curbs, gutters, inlets, swales, pipes, flumes, channels, open waterways, detention, and water quality BMPs. The collection system is critical to the protection of adjacent streets and properties from flooding. The objective of the site collection system is to completely collect and convey the 25-year design flow and protect properties adjacent to streets during runoff from up to the 100-year design flow. The combination of drainage improvements and surface grading must convey all runoff to the detention basin serving the site. Discharges from the site must connect directly to the existing drainage system where possible, as opposed to discharging to the street. Provision must be made to protect streets and sidewalks from flooding. Discharges to the street should not exceed the street design criteria and discharges across a sidewalk must protect the sidewalk from inundation up to the 2-year flow. Inlets should be properly selected for site conditions to minimize the possibility of clogging and the resulting potential for damage. Typical inlet types include curb opening inlets, open-side drop inlets and grated inlets. See Chapter 6, Streets, Inlets and Storm Drains, for more detailed design criteria.

2.3.3 Site Detention

Any development that increases runoff must address runoff through construction of onsite detention or other compensatory measure approved by the City. Detention for flood control is designed to prevent increases in peak flow from the 1-, 10-, and 100-year storms. Onsite detention should be located at the low point(s) on the site and discharge to a public right-of-way, drainage easement, or certified natural surface water channel (as defined in the Missouri courts; also see Chapter 4). The basin should be planned to match existing topography to minimize cut and fill, land disturbance, and environmental impacts. Aesthetics should be considered during design so that the facility complements surrounding land uses. Opportunities should be sought in all developments to create amenities with detention basins

by utilizing permanent pools, gentle slopes, landscaping, and trees and incorporating multi-purpose uses, such as recreation. Refer to Chapter 9, Detention for Flood Control, for design criteria. Acceptable alternatives to constructing onsite detention may include:

- Offsite Detention: The developer may seek opportunities to modify an existing offsite basin or construct a new offsite basin to meet detention requirements. This can be a joint venture with other developers to provide regional detention. It is important that improvements be constructed to convey the increased runoff from the site to the offsite basin.

- Payment in Lieu of Constructing Detention: In accordance with City Code Chapter 96, Article I Control of Quantities, Division IV Regional Detention Basins, a payment in lieu of constructing detention may be acceptable if it can be shown that detention provides no downstream benefits. An application must be completed and submitted to the City prior to a payment in lieu of detention being accepted. These payments are generally not acceptable when downstream flooding problems are known to exist. The funds must be used for regional detention and conveyance improvements within the watershed.

- Constructing Downstream Improvements: A payment in lieu of constructing detention may be acceptable with the construction of certain downstream improvements. If the plan for downstream improvements is acceptable, the developer may apply the cost of constructing the improvements toward the cost of the payment in lieu of constructing detention.

In-line detention that collects offsite runoff should be avoided, particularly when the offsite runoff is greater than the onsite runoff. In these cases, the detention volume will likely be much greater than if the detention basin was an off-line basin collecting only onsite runoff. The larger the offsite area that drains through a detention basin, the less effective is the basin and the higher are basin construction costs due to increased volume requirements and control structure size. In addition, in-line detention basins along major drainageways may require a U.S. Army Corps of Engineers (USACE) Section 404 Permit. Therefore, it is preferred that detention be off-line with the waterway preserved in a more natural state.

Permanent pool detention basins are encouraged because they provide water quality, aesthetic and habitat benefits. When designed and constructed properly, they can be an amenity to both the development and the community. Refer to Chapter 9 for detailed design criteria for permanent pool detention areas.

Detention on or near the upstream portion of the site to reduce offsite peak runoff may be considered as an option to compensate for increased peak runoff from the site in cases where the low point of the site is not conducive to detention facilities. It must be shown that the total peak runoffs for the design storms at locations downstream of the site are no greater than pre-development conditions. Careful attention must

be given to peak runoff timing, and a conservative design may be appropriate to assure peaks are not increased due to inaccurate modeling of the peak timing.

2.3.4 Onsite Best Management Practices

Storm water quality BMPs are required on new developments to reduce impacts on downstream water quality and meet the requirements of the City's federally mandated National Pollutant Discharge Elimination System (NPDES) Phase I storm water permit. Planning for a new development should include determination of the BMPs to be used, which commonly include extended or wet detention, disconnecting impervious areas, and grass buffer strips, swales, and channels. Storm water quality and quantity (rate and volume) are closely related and should be planned and designed concurrently. BMPs should also include open channel designs that both filter runoff and maintain long-term stability, thereby reducing pollutants and sediment. Chapter 10, Water Quality, provides design criteria for several common BMPs for use in new developments and redevelopments. Chapter 8, Open Channels, provides criteria for open channel designs that provide stable channel linings and reduce the amount of impervious area.

2.4 Transportation

Developments near major transportation features and facilities, such as highways, railroads, and airports, should closely investigate the effects of any storm water conduits or structures related to the facility. Many flooding problems can be created by conduits or transportation-related structures, particularly by those that are older or inadequate. Many storm drainage problems can be avoided with cooperation and coordination between the developer or transportation agency and local governing authority over the drainage system. Culverts at highway or railroad embankments can cause drainage hazards such as excessive flooding upstream of the culvert or excessive flow velocity and erosion downstream of the culvert. These conditions should be investigated early in the planning process to determine what costs or limitations might be required. Proposals for new developments or improvements by transportation entities should be closely coordinated with the City to identify drainage issues, potential problems, and requirements.

2.5 Open Space

Floodplains are often excellent locations for community or neighborhood open space, particularly since the occasional flooding in these areas makes many developments unfeasible. In addition to reduction in flood risk to a community, leaving these spaces open can serve multiple purposes, such as water quality and habitat enhancement, greenway trails, and other recreational uses. Additional open space adjacent to floodplains may be appropriate for a broader riparian and buffer corridor, larger scale recreational uses,

or parks. The designer of new developments should consider these options for floodplains and consult the governing agency for any watershed plans that address land use along floodplains.

2.6 Required Permits

Planning for any new development must consider the need for city, county, state, and federal permits early in the planning process. This is particularly important when the development will involve construction along a major drainageway. Chapter 2 provides an overview of laws and regulations that authorize these permits, and the most common permits related to storm water runoff are listed below:

- Land Disturbance or Grading Permit: The primary permit is the Land Disturbance Permit from the Missouri Department of Natural Resources (MDNR). In Springfield, the developer must obtain this permit directly from MDNR prior to beginning grading for all land disturbances that are one acre or larger. A copy of the permit must be submitted to the City prior to any permits being issued. Outside of the City, in Greene County, application for the Land Disturbance Permit is administered by the County through a required Grading Permit.

- Public Improvement Construction Permit: This permit to construct public drainage improvements is obtained from the Department of Public Works. To obtain the permit, there must be an approved set of construction plans and the inspection fees must be paid. Request for inspection should occur 48 hours prior to beginning construction. Storm water controls must be in place prior to beginning other construction to ensure downstream flows are not increased. Controls may include construction of detention basins, sediment basins, silt fences, berms, swales, grading, channel erosion protection, and other measures.

- Building Permit: This permit to begin construction of a building, parking lot or other facility is obtained from the Department of Building Development Services. To obtain the permit, the site plan showing drainage improvements must be approved by the Department of Public Works. Storm water controls must be in place prior to obtaining the permit to ensure downstream flows are not increased. Controls may include construction of detention basins, sediment basins, silt fences, berms, swales, grading, channel erosion protection and other measures.

- Floodplain Construction Permit: As described in Section 2.2.3 and Chapters 1 and 2, Springfield participates in the NFIP, which requires that the City administer the rules of the NFIP through floodplain regulation. Depending on the proposal and circumstances, various permits may be required when a structure or fill are proposed in the floodplain or floodway. An elevation certificate is required for any structure constructed in the floodplain.

- USACE Section 404 Permit: The purpose of the USACE Section 404 program is to insure that the physical, biological, and chemical quality of the nation's water is protected from irresponsible and unregulated discharges of dredged or fill material that could permanently alter or destroy valuable water resources. Section 404 of the Clean Water Act requires approval from the USACE prior to discharging dredged or fill material into the "Waters of the U.S." Waters of the U.S. include essentially all surface waters, such as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters. Any waterway with a permanent flow of water is generally considered a Water of the U.S. Some intermittent waterways also may be considered Waters of the U.S. Wetlands are areas characterized by growth of wetland vegetation (e.g., bulrushes, cattails, rushes, sedges, willows, etc.) where the soil is saturated during a portion of the growing season or the surface is flooded during part of most years. Wetlands generally include swamps, marshes, bogs, and similar areas.

  Typical activities within Waters of the U.S. and adjacent wetlands that require Section 404 permits are:

  - Site development fill for residential, commercial, or recreational construction
  - Construction of in-channel structures
  - Placement of riprap
  - Construction of roads
  - Construction of dams
  - Any grading within the channel of Waters of the U.S.

  When activities of this type are proposed, the developer should contact the USACE to determine if a Section 404 Permit will be required and to identify major issues involved in obtaining the permit. The area in the City that is generally south of Division Street drains south to the White River and is in the USACE Little Rock District. The area in the City that is generally north of Division Street drains north to the Sac River and is in the USACE Kansas City District. The Section 404 Permit must be obtained prior to any construction permits being issued by the City.

  Section 401 of the Clean Water Act allows the state to require a water quality certification along with each Section 404 Permit. The MDNR Section 401 Water Quality Certification cannot be issued until the Section 404 Permit has been issued.

Other permits, licenses, or authorizations may also be required by other federal, state, and local agencies; the issuance of a Section 404 Permit does not relieve the proponent from obtaining such permits, approvals, licenses, etc.

3.0 DEVELOPMENT REVIEW PROCESS

3.1 Subdivisions

Early planning for a new subdivision should all include arrangement of a Pre-subdivision Review Meeting through the Planning and Development Department. This meeting is critical to the development of an acceptable stormwater management plan that will be less likely to experience problems in the review process and will result in a more efficient and optimum storm water design. At this meeting, major conceptual storm water issues can be identified to help with development of a design that can maximize flood control and water quality protection and minimize project costs and future conflicts and construction difficulties. Major design features that should be identified first are the preservation of and setbacks from major drainageways, the location and configuration of detention basins and water quality controls, and the location and configuration of streets and lots. Any watershed plans affecting the development should be identified so that compliance approach can be incorporated early in the design process. The developer should obtain a copy of the Preliminary Plat checklist and submittal requirements, as identified in Chapter 4, to begin preparation of acceptable storm water reports and plat layout. This information can also be obtained from the Planning and Development Department.

Prior to submittal of the Preliminary Plat for a hearing before the Planning and Zoning Commission, all requirements listed in the preliminary plat checklist and comments from the Pre-subdivision Review Meeting must be addressed. After the Preliminary Plat has been approved by City Council, the developer must submit final storm water reports and public improvement plans. Plans must be completed in accordance with this manual following the checklists and formats provided in Chapter 4, Plan Submittal.

After all public improvement plans have been filed and all public improvements have been constructed or escrowed by the developer, the Final Plat may be submitted for review to the Planning and Development Department. Constructed public storm water improvements must be accepted by the City or escrow of the public storm water improvements must be completed in accordance with the Preliminary Plat and City requirements. Storm water Services will review the Final Plat to check for consistency with the approved construction plans regarding common areas and drainage easements that contain drainage improvements.

A common problem experienced in the design of subdivisions is that the layout fails to account for the natural forms and topography of the land. Figure PL-1 contrasts the differences between a development that preserves existing drainage patterns and closely follows the existing land forms, thereby reducing

construction costs, compared with a development that does not consider the natural land forms, resulting in additional, unnecessary construction costs for the developer.

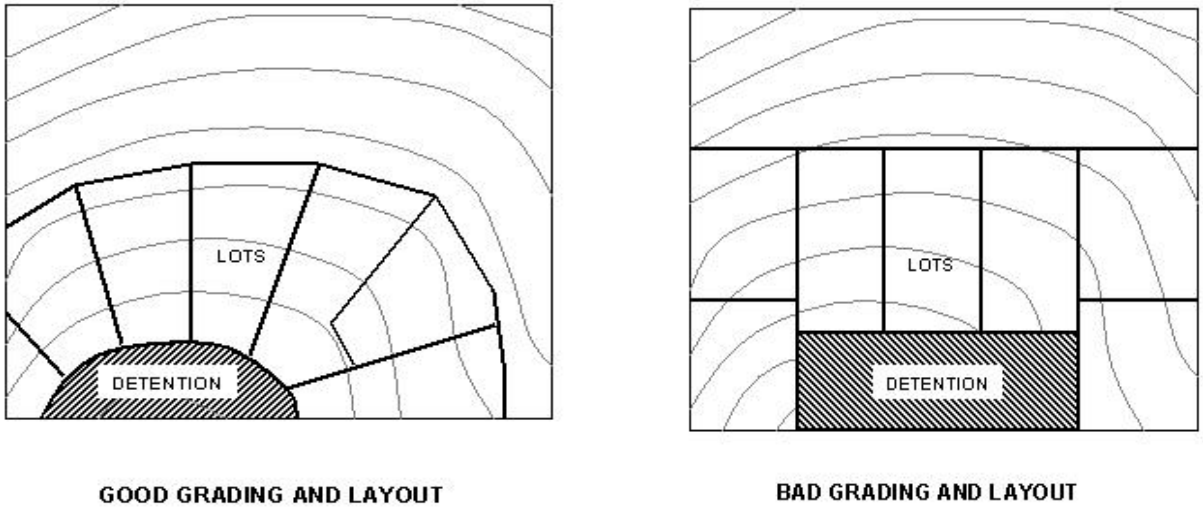

Figure PL-1
Examples of Good and Bad Grading and Lot Layout

3.2 Building Site Plans

Early stages of building site plan development should include review of this chapter to help identify major storm water issues. A pre-application conference should be arranged through Building Development Services which will include review and identification of major storm water issues by City staff. Sites that are part of a subdivision must adhere to the storm water plan for the subdivision or provide additional engineering analysis to justify modification of the plan. The design process should begin with designing around drainage patterns. If a detention basin is required, adequate space must be set aside to construct the basin according to the *City of Springfield, Missouri, Design Standards for Public Improvements.* Drainage leaving the site must be in accordance with the subdivision plan, which typically specifies connecting directly to a public drainage system, as opposed to draining over the land surface to a street. Any necessary improvements to convey offsite runoff across the site, such as runoff originating from a public street or another property, must be designed and constructed as public improvements. Submitted building site plans must be reviewed and approved prior to issuance of a building permit. Plans will be reviewed in accordance with the *Site Plan Design Guide* and this manual. See Chapter 4, Plan Submittal, for more information about building site plan submittal requirements.

3.3 Zoning Changes

When a property owner petitions the Department of Planning and Development for a change of zoning on a particular property, storm water and sinkhole reports must be submitted and approved, where applicable. These reports must be submitted and approved by Public Works if requested by City staff or the Planning and Zoning Commission due to concerns related to the rezoning. General requirements for change of zoning requests may be obtained from the Planning and Development Department, or Chapter 4, Plan Submittal. To discuss storm water issues specific to a site, contact the Department of Public Works Storm Water Services Division.

3.4 Planned Developments

General requirements for a planned development are specified in the Springfield Zoning Ordinance in the City Code, Chapter 36, Article 1, Section 4-2500.

3.5 Vacations

Vacations of public lands, rights-of-way, and alleys should be reviewed to determine whether the property contains a waterway or any other drainage with an offsite source. These areas must be dedicated as a public drainage easement as part of the vacation process.

4.0 REFERENCES

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